REMARKS

This amendment is in response to the Office Action of July 13, 1999 wherein the Examiner made certain technical objections to the specification and claims. In particular, the Examiner objected to the title which has been changed to be more descriptive.

The Examiner's objection to the specification for failing to describe Fig. 6 is not understood. Fig. 6 is described on page 22, lines 34 and 35 and page 24, lines 6-37.

The Examiner objected to the claims for certain technical reasons which are believed to have been obviated by the amendments herein.

The Examiner rejected claims 32-34 under 35 U.S.C. 103 as allegedly anticipated by Hendershot. The Examiner also rejected the remaining claims under the disclosure in Fig. 2 in view of Muelleman. The claims are likewise rejected over the aforementioned references in view of Elton '165. Certain claims are rejected over Hendershot in view of Elton.

The Examiner's rejection of the claims is respectfully traversed for the reasons set forth below.

The invention is directed to a plant for generating high voltage power using a rotating machine which employs a high voltage cable structure as a

winding therein. In the cable, an electric field confining insulating cover comprising a solid insulation layer flanked by inner and outer semiconducting layers produces an equipotential surface operative to enclose the electric field within the cable and thereby reduce electrical stress in the insulation. Thus, the invention permits high voltage operation not previously available. In particular, the invention allows for direct connection of the power generating plant to the grid.

The invention also employs a conductive core in the cable which is formed of a plurality of insulated conductive strands and at least one uninsulated conductive strand in contact with the insulating cover. This arrangement does two things. First, the insulating strands carry high voltage, and at the same time, reduce or minimize eddy current flow between the strands. This is advantageous, because, if not controlled, the induced eddy currents, at the power levels contemplated, would produce prohibitive electrical losses and would cause the cable to overheat. In addition, the uninsulated strands in contact with the covering help to establish the equipotential surface around the conductive core to thereby reduce electrical field stress which allows for direct connection to the grid without failure due to partial discharge.

The claims as amended stress these features and are thus believed to overcome the various objections noted by the Examiner. Claim 1 as amended is directed to a plant for generating high voltage power which employs a rotating machine having a cable formed with a field confining cover and a core with insulated and uninsulated strands. The field confining cover allows high voltage operation and the insulated strands reduce eddy currents. The uninsulated strand in contact with the cover helps to establish the equipotential surface.

Claim 21 is directed to a plant for generating high voltage power employing a machine with a winding having a current carrying conductor surrounded by a field confining insulating cover which includes an inner semiconducting layer, a solid insulation and an outer semiconducting layer.

Claims 32-34 which are rejected as allegedly anticipated by Hendershot have been made dependent upon claim 21.

Claims 39 and 52 are similar to claims 1 and 21 respectively.

Claim 36 is a method claim in which a high voltage cable is threaded in the machine. New method claims 53 and 54 depend from claim 36.

With respect to the Examiner's rejection of certain claims over Fig. 2 in view of Muelleman, it is respectfully submitted that the power generating system of the invention is not based upon the use of a filter to suppress transient

impulses. Indeed, the arrangement of Fig. 1 of the present specification shows such a filter. The present invention is based upon the discovery that a direct connection can be made between the power generating plant and the network because the windings in the generator are capable of operating at the same voltage as the grid without experiencing failure due to partial discharge. Thus, the approach of the invention (i.e. field control) is entirely different from the approach suggested by the reference (i.e. filtering). In addition, there is no indication that the cited reference would operate at high voltage.

The combination of Fig. 2 with Muelleman and Elton is likewise believed to be inapplicable. Elton describes a high voltage cable having an inner layer of semiconducting pyrolyzed glass fiber material and/or an outer layer of the same material whereby the outer layer is grounded. When Elton is viewed as a whole it does not suggest that such an electrical cable would be useful in the present invention.

The Examiner asserts that Fig. 2 and Muelleman describes the present invention except for utilizing a cable in the electrical machine having conductors with semiconducting properties. However, it is respectfully submitted that once the teaching of Elton is fully considered, the combination asserted by the Examiner should be withdrawn. Even though it is suggested in Elton to apply a

semiconducting layer to a winding is a dynamo-electric machine, there is no indication to use the cable described in Elton in a dynamo-electric machine. Indeed, the disclosure of Elton describes at least three different applications for a semiconducting layer. One application uses a pyrolyzed glass layer in a conventional high current, low voltage winding of a dynamo-electric machine. Elton, therefore, does not attempt to create a high voltage machine, but simply tries to improve a conventional low voltage machine having end winding control. The present invention does not employ end winding control. A second application is for a housing to reduce electric discharge in an enclosed circuit. In other words, the material is used as a shield to protect an enclosed circuit. Finally, Elton employs a semiconducting pyrolyzed glass layer in a conventional cable. However, there is no proposal to use the cable shown in Elton in a dynamo-electric machine. It is only the semiconducting tape that is used in an electric machine. The arrangement in Elton does not provide a solid insulating system as described and disclosed in the present invention. Thus, it cannot be considered obvious to one skilled in the art to use such a cable in a machine, because at the time of the invention, it was not known to use such a cable with solid insulation as a winding in a machine, and there is no teaching that would lead one skilled in the art to the conclusion that the cable in Elton would operate

as a winding in a high voltage machine. It should be further understood that the cable in Elton would have to be further modified to employ insulated and uninsulated strands to reduce the eddy currents which would be induced in a conventional cable without insulated strands and which would cause prohibitive losses.

With respect to the Examiner's rejection of the claims as unpatentable over Hendershot in view of Elton, the same analysis as noted above is applicable. Hendershot simply shows a polyphase switched reluctance motor. Hendershot does not show a high voltage generating plant. It simply shows a motor with poles having a magnetic circuit with a radial component. There is no suggestion that the cable of Elton would be useful in the machine of Hendershot.

Applicants wish to bring to the Examiner's attention, Breitenbach et al., U.S. Patent No. 4,785,138 which has been cited in a number of related applications, some of which are noted in the Information Disclosure Statement filed with the application. Breitenbach et al. discloses a cable for use in a linear motor where the cable includes a current carrying conductor, a conductive inner layer surrounding the conductor, an insulation layer surrounding an inner layer and an outer conductive layer surrounding an insulating layer and a conductive sheathing surrounding the entire cable. The present invention is directed to a

generating device in which at least one of the windings comprises a cable including a conductive member, an inner semiconducting layer, an insulation layer and an outer semiconducting layer. In addition, the present invention employs insulated and uninsulated strands in the conductive member. Breitenbach et al. discloses an electrical cable for use as a phase winding in a linear motor. In such motors, the stator can be very long and the winding is fixed in a meander like fashion. Linear motors are used in intermittent service, for example as a motor power unit in a train for railway operations. In such applications, the stator is divided into sections, each section length being several hundred meters. The length of the stator is such that the inductance and consequently the reluctance of the winding is very high. Therefore, voltages of about 10kV are needed to obtain sufficient high current in the winding for driving trains. Such a high current requires a conductive with a considerable total conducting area. However, the voltages are still only in a low voltage region of about to about 1 to 10kV. Electric machines of the type described in the invention differ from a linear motor generally in that the former is run continuously using the same windings, wherein as a linear motor is run intermittently and has time to cool. The insulated strands in the core element of the present invention, not present in Breitenbach, prevent high eddy currents

from overheating the cable. Breitenbach also suggests that the conductive outer layer allows a path for charge currents so as to prevent scorch spots where the phases come into contact. The present invention is designed to avoid such high current in the cable insulation.

The Examiner cited but did not apply Nikitin. However, this reference has been cited and applied in other cases and some brief comments are believed to be in order. Nikitin shows a high voltage element in an insulating sleeve. Nikitin develops a high voltage generator based upon a complex and expensive oil/paper insulation system used for both insulation and cooling as is done in conventional power transformers. This differs from the present invention in many respects. One of the most important features of the invention is that it uses a solid insulation with semiconducting layers giving full control of the electric fields within the stator winding as it is positioned in the stator and in the end winding areas. Nikitin et al. shows an arrangement of a cable type termination around high voltage elements. See for example column 3, lines 21-26. Outside the termination, in the end region, the electric field is no longer confined within the stator winding. The end winding region of Nikitin is filled with oil for insulation and cooling. The present invention does not use end winding terminations or oil insulation. Another important difference is that Nikitin teaches

a limited number of slots per pole in the stator winding. See for example column 2, line 68 - column 3, line 1 and Fig. 3. The present invention uses numerous slots for a pole.

The attached Information Disclosure Statement notes the references which were filed in the office of Examiner Gelner on September 29, 1999. The Information Disclosure Statement is the subject of a petition to suspend the rules in connection with a bulk filing of related applications. Consideration of the references is earnestly solicited. For the Examiner's convenience, a copy of each reference specifically discussed herein is attached.

In view of the foregoing, it is respectfully requested that the Examiner reconsider his rejection of the claims, the allowance of which is earnestly solicited.

Respectfully submitted,

John P. DeLuca
Registration No. 25,505

WATSON COLE GRINDLE WATSON, P.L.L.C.
1400 K Street, N.W., 10th Floor
Washington, D.C. 20005-2477
(202) 628-0088